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SELECTION OF THE BEST SCHOOL FOR THE CHILDREN- A DECISION MAKING MODEL USING EXTENT ANALYSIS METHOD ON FUZZY ANALYTIC HIERARCHY PROCESS

Reshma Radhakrishnan[1], A. Kalaichelvi[2]

Research Scholar, Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India. [1]

Associate Professor of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women Coimbatore, India. [2]

Abstract: Parents have a growing array of options in choosing a school, though the extent of the options varies from place to place. In this paper, the Extent Analysis Method on Fuzzy Analytic Hierarchy Process (abbreviated as Fuzzy AHP) is used to develop a decision making model for choosing the best school for the children.

Keywords: Fuzzy Analytic Hierarchy Process, Triangular Fuzzy numbers, Extent analysis Method, Pairwise Comparison, Fuzzy Synthetic Extent.

I. INTRODUCTION

Decision Making is the act of choosing between two or more courses of action. Decision-making can also be regarded as a problem-solving activity terminated by a solution deemed to be satisfactory among several alternative possibilities. It is, therefore, a reasoning or emotional process which can be rational or irrational and can be based on explicit assumptions or implicit assumption. There are processes and techniques to improve decision-making and the quality of decisions.

Nowadays, decision making is a problem of every common man to take right decision on many routine affairs like education for children, food, transportation, purchase of durables, healthcare, shelter and so on. In this research the authors consider the problem of selecting the best school for the children. Parents have a growing array of options in choosing a school, though the extent of the options varies from place to place. Generally parents consider various factors to select the best school for their children. The researchers identified many such important factors and used the same to develop a mathematical model for decision making regarding the selection of right school for the children using Extent Analysis Method on Fuzzy Analytic Hierarchy Process.

II. BASIC DEFINITIONS

Definition: 1 [2]

A ***Fuzzy Number*** $\tilde{A}$ is a convex, normal fuzzy set $A \subset \mathbb{R}$ whose membership function is at least segmentally continuous and has functional value $\mu_A(x) = 1$ at precisely one element.

Definition: 2 [11]

A ***Triangular Fuzzy Number*** is a special case of fuzzy number. It is defined by a triplet $\tilde{A} = (a, b, c)$. This representation is interpreted as membership function $\mu_{\tilde{A}}: \mathbb{R} \to [0,1]$ as follows:

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$$\mu_{\tilde{A}}(x) = \begin{cases} 0 & if \quad x \le a \\ \frac{x-a}{b-a} & if \ a \le x \le b \\ \frac{c-x}{c-b} & if \ b \le x \le c \\ 0 & if \quad x > c \end{cases}$$

Definition: 3 [6]

Algebraic Operations: Let $\tilde{A} = (a_1, b_1, c_1)$ and $\tilde{B} = (a_2, b_2, c_2)$ be two triangular fuzzy numbers.

i) Addition of Triangular Fuzzy Numbers $\oplus$: $\tilde{A} \oplus \tilde{B} = (a_1 + a_2, b_1 + b_2, c_1 + c_2)$

ii) Multiplication of Triangular Fuzzy Numbers $\otimes$: $\tilde{A} \otimes \tilde{B} = (a_1 a_2, b_1 b_2, c_1 c_2) \qquad a_1 \ge 0, a_2 \ge 0$

iii) Division of Triangular Fuzzy Numbers $\oslash$: $\tilde{A} \oslash \tilde{B} = \left(\frac{a_1}{c_2}, \frac{b_1}{b_2}, \frac{c_1}{a_2}\right) \qquad a_1 > 0, a_2 > 0$

$$\tilde{A}^{-1} = (a_1, b_1, c_1)^{-1} = \left(\frac{1}{c_1}, \frac{1}{b_1}, \frac{1}{a_1}\right) \qquad a_1 > 0$$

Definition 4 [1]

A *Triangular Fuzzy Number Matrix* of order $n \times m$ is defined as $A = \left(\widetilde{a_{ij}}\right)_{n\times m}$ where $\widetilde{a_{ij}}$ is a triangular fuzzy number.

For two Triangular Fuzzy Number Matrices $A = \left(\widetilde{a_{ij}}\right)_{n\times m}$ and $B = \left(\widetilde{b_{ij}}\right)_{n\times m}$ the ***Addition*** $A + B$ is defined as

$$A + B = \left(\widetilde{a_{ij}} \oplus \widetilde{b_{ij}}\right)_{n\times m}$$

III. EXTENT ANALYSIS METHOD

The extent analysis method is used to consider the extent to which an object can satisfy the goal, i.e., satisfaction extent. In this method the "extent" is quantified using triangular fuzzy number. On the basis of fuzzy values for the extent analysis of each object, a fuzzy synthetic degree values can be obtained, which is defined as follows:

Let $X = \{x_1,\ x_2, \dots, x_n\}$ be an object set and $U = \{u_1,\ u_2, \dots, u_m\}$ be a goal set. Each object is taken and extent analysis for each goal g_i is performed, respectively. Therefore, m extent analysis values for each object can be obtained, with the following signs:

$$M_{g_i}^1, M_{g_i}^2, \dots, M_{g_i}^m \qquad i = 1,2, \dots n$$

where all $M_{g_i}^j$ $(j = 1,2, \dots m)$ are triangular fuzzy numbers.

The steps for extent analysis method on Fuzzy AHP can be given as in the following.

Step 1: **Construction of the Fuzzy AHP comparison matrix**

The first task of the fuzzy AHP method is to decide on the relative importance of each pair of factors in the same hierarchy. The pairwise comparisons are described by values taken from a pre-defined set of ratio scale values as presented in Table 1.

Linguistic scale	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Equally important	(1/2, 1, 3/2)	(2/3, 1, 2)
Weakly more important	(1, 3/2, 2)	(1/2, 2/3, 1)
Strongly more important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly more important	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Absolutely more important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

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Table 1. Triangular Fuzzy Conversion Scale

By using triangular fuzzy numbers, via pairwise comparison, the fuzzy evaluation matrix $A = \left(\widetilde{a_{ij}}\right)_{n \times m}$ is constructed; where $\widetilde{a_{ij}} = \left(l_{ij},\ m_{ij},\ u_{ij}\right)$ is the relative importance of i^{th} element over j^{th} element in pair wise comparison and l_{ij}, m_{ij}, u_{ij} are the lower bound, model, upper bound values of $\widetilde{a_{ij}}$ respectively. Also $\widetilde{a_{ij}}$ are satisfied with

$$l_{ij} = \frac{1}{l_{ji}},\ \ m_{ij} = \frac{1}{m_{ji}},\ \ u_{ij} = \frac{1}{u_{ji}}$$

Step 2: **Calculation of the Value of fuzzy synthetic extent**

The value of fuzzy synthetic extent with respect to the i^{th} object is defined as

$$S_i = \sum_{j=1}^{m} M_{g_i}^{j} \otimes \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{g_i}^{j}\right]^{-1} \tag{1}$$

Here S_i is defined as the fuzzy synthetic extent and $\otimes$ is the multiplication of Triangular Fuzzy Numbers.

Step 3: **Calculation of the sets of weight values of the Fuzzy AHP**

To obtain the estimates for the sets of weight values under each criterion, it is necessary to consider a principle of comparison for fuzzy numbers.

Definition 5 [5]

The degree of possibility of

$$M_1 = (l_1, m_1, u_1) \geq M_2 = (l_2, m_2, u_2)$$

is defined as

$$V(M_1 \geq M_2) = \sup_{x \geq y}\left[min\left(\mu_{M_1}(x), \mu_{M_2}(x)\right)\right]$$

When a pair (x, y) exists such that $x \geq y$ and $\mu_{M_1}(x) = \mu_{M_2}(x)$, then we have $V(M_1 \geq M_2) = 1$. Since M_1 and M_2 are convex fuzzy numbers we have that

$$V(M_1 \geq M_2) = 1 \qquad iff \quad m_1 \geq m_2$$

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_1}(d)$$

where d is the ordinate of the highest intersection point D between $\mu_{M_1}(d)$ and $\mu_{M_2}(d)$. Also the above equation can be equivalently expressed as follows:

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_1}(d)$$

$$= \begin{cases} 1 & if\ \ m_2 \geq m_1 \\ 0 & if\ \ \ l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & otherwise \end{cases} \tag{2}$$

The following figure illustrates Equation (2)

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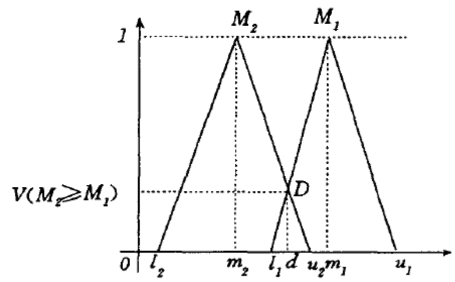

Fig.1 The intersection between M_1 and M_2

To compare M_1 and M_2 , we need both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$.

Definition 6 [5]

The degree of possibility for a convex fuzzy number to be greater than k convex fuzzy numbersM_i $(i = 1, \cdots k)$ can be defined by

$$V(M \geq M_1, \cdots, M_k) = V[(M \geq M_1) \; and \; (M \geq M_2) \; and \; \cdots and \; (M \geq M_k)]$$

$$= \min V(M \geq M_i) \qquad i = 1, \cdots k$$

Assume that

$$d'(A_i) = \min \; V(S_i \geq S_k)$$

For $k = \; 1, 2, \ldots, n; \;\; k \neq i$.

Then the weight vector is given by

$$W' = \left(d'(A_1), d'(A_2), \cdots, d'(A_n)\right)^T$$

where A_i $(i = 1, \cdots, n)$ are n elements.

Via normalization, the normalized weight vectors are

$$W = (d(A_1), d(A_2), \cdots, d(A_n))^T$$

where W is a non fuzzy number.

Step 4: **Aggregate the relative weights of decision elements to obtain an overall rating for the alternatives.**

Finally the alternative with highest weight is chosen as the best alternative.

IV. APPLICATION OF EXTENT ANALYSIS METHOD ON FUZZY AHP

Based on the pilot study, the researchers identified five major criteria for developing a model for the selection of the best school by the parents for their children. Further, care was taken to enlist possible sub criteria for each major criteria, which are considered by them as vital for achieving the objective. The details are presented below.

1) **C_1 : Distance and Transport**
   Sub Criteria
   C_{11} : Transportation Offered
   C_{12} : Location of the School
2) **C_2 : Cost**
   Sub Criteria
   C_{21} : Admission Fees

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C_{22} : Fees Structure

3) **C_3 : Staff and Curriculum**
   Sub Criteria
   C_{31} : Competent Staff
   C_{32} : Teaching and coaching
   C_{33} : Extra Curricular Activities
4) **C_4 : Atmosphere**
   Sub Criteria
   C_{41} : Infrastructure
   C_{42} : Campus Discipline
   C_{43} : Facilities and Security
5) **C_5 : Administration**
   Sub Criteria
   C_{51} : Academic Performance
   C_{52} : Staff and Student Welfare
   C_{53} : Reporting to parents

After the initial screening, three schools listed below were considered as alternatives and an attempt has been made by the researchers to develop a model to select the best one based on the above criteria.

1) A_1 : P.M.G HIGHER SECONDARY SCHOOL, COLLEGE ROAD, PALAKKAD
2) A_2 : BHARATH MATHA HIGHER SECONDARY SCHOOL, CHANDRANAGAR, PALAKKAD
3) A_3 : VYASA VIDYA PEETHOM SCHOOL, KALLEKAD, PALAKKAD.

After building the hierarchy, the pairwise comparison of the importance of one criterion over the others, one sub criterion over the others and one alternative over the others were estimated with the help of a pre-tested questionnaire. A sample of 100 parents in Palakkad city was selected by adopting convenient sampling technique and the questionnaire was administered to the parents. The data collected were edited and tabulated for further analysis. Five point scaling technique (Equally Important, Weakly More Important, Strongly More Important, Very Strongly More Important, Absolutely More Important) was adopted to assess the degree of importance of one criterion, sub criterion, or alternative over another. Using Triangular Fuzzy Conversion Scale given in Table 1, the pairwise comparison matrices (Triangular Fuzzy Number Matrices $A_i, i = 1, \dots 100$) for 100 respondents are constructed. By using the definition of addition of Triangular Fuzzy Number Matrices a new matrix $D = A_1 + A_2 + \cdots + A_{100}$ is arrived. Then by taking average of each element in the matrix D (the average is based only on the number of responses) the aggregated fuzzy evaluation matrix is constructed (Table 2).

$$
\begin{array}{c}
\\ C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5
\end{array}
\begin{array}{c}
\begin{array}{ccccc} \quad C_1 \quad & \quad C_2 \quad & \quad C_3 \quad & \quad C_4 \quad & \quad C_5 \quad \end{array} \\
\begin{pmatrix}
(1,1,1) & (1.08,1.58,2.08) & (0.86,1.36,1.86) & (0.93,1.43,1.93) & (1.38,1.87,2.36) \\
(0.48,0.63,0.93) & (1,1,1) & (1.06,1.56,2.06) & (1.17,1.67,2.17) & (1.65,2.15,2.65) \\
(0.54,0.74,1.16) & (0.49,0.64,0.94) & (1,1,1) & (1.13,1.63,2.13) & (1.88,2.38,2.88) \\
(0.52,0.7,1.08) & (0.46,0.6,0.85) & (0.47,0.61,0.88) & (1,1,1) & (1.97,2.47,2.97) \\
(0.42,0.53,0.72) & (0.38,0.47,0.61) & (0.35,0.42,0.53) & (0.34,0.4,0.51) & (1,1,1)
\end{pmatrix}
\end{array}
$$

Table 2. Fuzzy Evaluation Matrix with respect to the goal

Then applying formula (1),

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$$S_1 = (5.25,7.24,9.23) \otimes \left(\frac{1}{36.3},\frac{1}{28.84},\frac{1}{22.56}\right) = (0.14,0.25,0.41)$$

$$S_2 = (5.36,7.01,8.81) \otimes \left(\frac{1}{36.3},\frac{1}{28.84},\frac{1}{22.56}\right) = (0.147,0.24,0.39)$$

$$S_3 = (5.04,6.39,8.11) \otimes \left(\frac{1}{36.3},\frac{1}{28.84},\frac{1}{22.56}\right) = (0.139,0.22,0.36)$$

$$S_4 = (4.42,5.38,6.78) \otimes \left(\frac{1}{36.3},\frac{1}{28.84},\frac{1}{22.56}\right) = (0.12,0.19,0.3)$$

$$S_5 = (2.49,2.82,3.37) \otimes \left(\frac{1}{36.3},\frac{1}{28.84},\frac{1}{22.56}\right) = (0.07,0.1,0.15)$$

Using formula (2),

$$V(S_1 \geq S_2) = V(S_1 \geq S_3) = V(S_1 \geq S_4) = V(S_1 \geq S_5) = 1$$

$$V(S_2 \geq S_1) = \frac{0.14 - 0.39}{(0.24 - 0.39) - (0.25 - 0.14)} = 0.96$$

$$V(S_2 \geq S_3) = V(S_2 \geq S_4) = V(S_2 \geq S_5) = 1$$

$$V(S_3 \geq S_1) = \frac{0.14 - 0.36}{(0.22 - 0.36) - (0.25 - 0.14)} = 0.88$$

$$V(S_3 \geq S_2) = \frac{0.147 - 0.36}{(0.22 - 0.36) - (0.24 - 0.147)} = 0.91$$

$$V(S_3 \geq S_4) = V(S_3 \geq S_5) = 1$$

$$V(S_4 \geq S_1) = \frac{0.14 - 0.3}{(0.19 - 0.3) - (0.25 - 0.14)} = 0.73$$

$$V(S_4 \geq S_2) = \frac{0.147 - 0.3}{(0.19 - 0.3) - (0.24 - 0.14)} = 0.75$$

$$V(S_4 \geq S_3) = \frac{0.139 - 0.3}{(0.19 - 0.3) - (0.22 - 0.139)} = 0.84$$

$$V(S_4 \geq S_5) = 1$$

$$V(S_5 \geq S_1) = \frac{0.14 - 0.15}{(0.1 - 0.15) - (0.25 - 0.14)} = 0.063$$

$$V(S_5 \geq S_2) = \frac{0.147 - 0.15}{(0.1 - 0.15) - (0.24 - 0.147)} = 0.021$$

$$V(S_5 \geq S_3) = \frac{0.139 - 0.15}{(0.1 - 0.15) - (0.22 - 0.139)} = 0.084$$

$$V(S_5 \geq S_4) = \frac{0.12 - 0.15}{(0.1 - 0.15) - (0.19 - 0.12)} = 0.25$$

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Thus,

$$d'(C_1) = \min\ V(S_1 \geq S_2, S_3, S_4, S_5) = \min(1,1,1,1) = 1$$

$$d'(C_2) = \min\ V(S_2 \geq S_1, S_3, S_4, S_5) = \min(0.96,1,1,1) = 0.96$$

$$d'(C_3) = \min\ V(S_3 \geq S_1, S_2, S_4, S_5) = \min(0.88,0.91,1,1) = 0.88$$

$$d'(C_4) = \min\ V(S_4 \geq S_1, S_2, S_3, S_5) = \min(0.73,0.75,0.84,1) = 0.73$$

$$d'(C_5) = \min\ V(S_5 \geq S_1, S_2, S_3, S_4) = \min(0.063,0.021,0.084,0.25) = 0.021$$

Therefore,

$$W' = (1,0.96,0.88,0.73,0.021)^T$$

Via normalization, the weight vectors with respect to the decision criteria C_1, C_2, C_3, C_4, C_5 are obtained as

$$W = (0.28,0.27,0.25,0.2,0.006)^T$$

In a similar manner the aggregated pairwise comparison matrices for sub criteria with respect to each criteria are constructed, as shown below.

$$\begin{array}{c|cc} & C_{11} & C_{12} \\ \hline C_{11} & (1,1,1) & (1.27,1.77,2.27) \\ C_{12} & (0.44,0.56,0.79) & (1,1,1) \end{array}$$

Table 3. Sub-criteria matrix with respect to C_1

The weight vector from Table 3 is calculated as $W_1 = (0.91,0.088)^T$

$$\begin{array}{c|cc} & C_{21} & C_{22} \\ \hline C_{21} & (1,1,1) & (1.03,1.53,2.03) \\ C_{22} & (0.49,0.65,0.97) & (1,1,1) \end{array}$$

Table 4. Sub-criteria matrix with respect to C_2

The weight vector from Table 4 is calculated as $W_2 = (0.71,0.29)^T$

$$\begin{array}{c|ccc} & C_{31} & C_{32} & C_{33} \\ \hline C_{31} & (1,1,1) & (0.69,1.18,1.68) & (1.38,1.88,2.38) \\ C_{32} & (0.6,0.85,1.45) & (1,1,1) & (2.18,2.68,3.18) \\ C_{33} & (0.42,0.53,0.72) & (0.31,0.37,0.46) & (1,1,1) \end{array}$$

Table 5. Sub-criteria matrix with respect to C_3

The weight vector from Table 5 is calculated as $W_3 = (0.22,0.24,0.54)^T$

$$\begin{array}{c|ccc} & C_{41} & C_{42} & C_{43} \\ \hline C_{41} & (1,1,1) & (0.74,1.24,1.74) & (0.58,1.08,1.58) \\ C_{42} & (0.57,0.81,1.35) & (1,1,1) & (0.62,1.12,1.62) \\ C_{43} & (0.63,0.93,1.72) & (0.62,0.89,1.61) & (1,1,1) \end{array}$$

Table 6. Sub-criteria matrix with respect to C_4

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The weight vector from Table 6 is calculated as $W_4 = (0.36,0.32,0.317)^T$

$$\begin{array}{c} \\ C_{51} \\ C_{52} \\ C_{53} \end{array} \begin{array}{c} \begin{array}{ccc} C_{51} & C_{52} & C_{53} \end{array} \\ \begin{bmatrix} (1,1,1) & (0.7,1.2,1.7) & (1.07,1.57,2.07) \\ (0.59,0.83,1.4) & (1,1,1) & (1.15,1.65,2.15) \\ (0.48,0.64,0.93) & (0.47,0.61,0.87) & (1,1,1) \end{bmatrix} \end{array}$$

Table 7. Sub-criteria matrix with respect to C_5

The weight vector from Table 7 is calculated as $W_5 = (0.41,0.39,0.204)^T$

In the next step of the decision procedure, the alternatives under each sub criteria are compared. The results are shown below.

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{ccc} A_1 & A_2 & A_3 \end{array} \\ \begin{bmatrix} (1,1,1) & (0.99,1.49,1.99) & (0.97,1.47,1.97) \\ (0.5,0.67,1.01) & (1,1,1) & (1.21,1.71,2.21) \\ (0.51,0.68,1.03) & (0.45,0.58,0.83) & (1,1,1) \end{bmatrix} \end{array}$$

Table 8. Alternative matrix with respect to C_{11}

The weight vector from Table 8 is calculated as $W_{11} = (0.45,0.37,0.18)^T$

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{ccc} A_1 & A_2 & A_3 \end{array} \\ \begin{bmatrix} (1,1,1) & (1.25,1.75,2.25) & (1.24,1.74,2.24) \\ (0.44,0.57,0.8) & (1,1,1) & (1.18,1.68,2.18) \\ (0.45,0.574,0.81) & (0.46,0.6,0.85) & (1,1,1) \end{bmatrix} \end{array}$$

Table 9. Alternative matrix with respect to C_{12}

The weight vector from Table 9 is calculated as $W_{12} = (0.47,0.3,0.23)^T$

Using similar calculations, the weight vectors of the alternatives with respect to

the sub-criteria C_{21} is calculated as $W_{21} = (0.58,0.32,0.098)^T$

the sub-criteria C_{22} is calculated as $W_{22} = (0.59,0.37,0.044)^T$

the sub-criteria C_{31} is calculated as $W_{31} = (0.62,0.36,0.025)^T$

the sub-criteria C_{32} is calculated as $W_{32} = (0.47,0.43,0.11)^T$

the sub-criteria C_{33} is calculated as $W_{33} = (0.52,0.46,0.022)^T$

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the sub-criteria C_{41} is calculated as $W_{41} = (0.46,0.39,0.15)^T$

the sub-criteria C_{42} is calculated as $W_{42} = (0.46,0.38,0.16)^T$

the sub-criteria C_{43} is calculated as $W_{43} = (0.48,0.4,0.12)^T$

the sub-criteria C_{51} is calculated as $W_{51} = (0.54,0.44,0.022)^T$

the sub-criteria C_{52} is calculated as $W_{52} = (0.52,0.4,0.08)^T$

the sub-criteria C_{53} is calculated as $W_{53} = (0.47,0.39,0.14)^T$

Sub-criterias of C_1				
	C_{11}	C_{12}		Alternative Priority Weight
Weight	0.91	0.088		
Alternative				
A_1	0.45	0.47		0.45
A_2	0.37	0.3		0.36
A_3	0.18	0.23		0.18
Sub-criterias of C_2				
	C_{21}	C_{22}		Alternative Priority Weight
Weight	0.71	0.29		
Alternative				
A_1	0.58	0.59		0.58
A_2	0.32	0.37		0.33
A_3	0.098	0.044		0.08
Sub-criterias of C_3				
	C_{31}	C_{32}	C_{33}	Alternative Priority Weight
Weight	0.22	0.24	0.54	
Alternative				
A_1	0.62	0.47	0.52	0.53
A_2	0.36	0.43	0.46	0.43
A_3	0.025	0.11	0.022	0.04
Sub-criterias of C_4				
	C_{41}	C_{42}	C_{43}	Alternative Priority Weight
Weight	0.36	0.32	0.317	
Alternative				
A_1	0.46	0.46	0.48	0.46
A_2	0.39	0.38	0.4	0.39
A_3	0.15	0.16	0.12	0.14
Sub-criterias of C_5				
	C_{51}	C_{52}	C_{53}	Alternative Priority Weight
Weight	0.41	0.39	0.204	
Alternative				
A_1	0.54	0.52	0.47	0.52
A_2	0.44	0.4	0.39	0.42
A_3	0.022	0.08	0.14	0.07

Main Criteria of the Goal						
	C_1	C_2	C_3	C_4	C_5	Alternative Priority Weight

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Weight	0.28	0.27	0.25	0.2	0.006	
Alternative						
A_1	0.45	0.58	0.53	0.46	0.52	**0.51**
A_2	0.36	0.33	0.43	0.39	0.42	0.38
A_3	0.18	0.08	0.04	0.14	0.7	0.11

Table 10. Obtained Results

The combination of priority weights for criteria, sub criteria and alternatives to determine the priority weight for the best school are shown in Table 10. Based on this result alternative 1(P.M.G Higher Secondary School, College Road, Palakkad) which has the highest alternative priority weight 0.51 is found to be the best school.

V. CONCLUSION

People often find it hard to make decisions in a complex, subjective situation with more than a few realistic options. So we need a systematic, organized mathematical way to evaluate our choices and figure out which one offers the best solution to our problem. Application of the Extent Analysis Method on Fuzzy AHP in real life problems helps the people to take a correct decision from the available alternatives.

REFERENCES

[1] Amiya, K. Shyamal and Pal, M., “Triangular Fuzzy Matrices”, Iranian Journal of Fuzzy System, Vol. 4(1), pp. 75-87, 2007.
[2] Bernd Moller, Michal Beer, “ Fuzzy Randomness, Uncertainty in Civil Engineering and Computational Mechanics”, Springer-Verlag Berlin Heidelberg New York, pp. 21-22, 2004.
[3] Chang, D.Y., “Extent Analysis and Synthetic Decision, Optimization Techniques and Applications”, World Scientific, Singapore, Vol.1, pp. 352.1992.
[4] Cengiz Kahraman, “ Fuzzy Multi-Criteria Decision Making- Theory And Applications With Recent Developments”, Springer Optimization and Its Applications, Vol.16, pp. 53-82, 2008.
[5] Chang, Da-Yong, “Application Of Extent Analysis Method on Fuzzy AHP”, Europian Journal Of Operatiom Research, Vol. 95, pp. 649-655, 1996.
[6] Chou, Chien-Chang and Ker-Wei, Yu, “Application Of A New Hybrid Fuzzy AHP Model To The Location Choice”, Mathematical Problems In Engineering, pp. 1-12, 2013.
[7] Erdal Cakir, Hakan Tozan, and Ozalp Vayvay, “A Method For Selecting Third Party Logistic Service Provider Using Fuzzy AHP”, Journal of Naval Science and Engineering, Vol. 5, No.3, pp. 38-54, 2009
[8] Golam Kabir,and Razia Sultana Sumi, “Integrating Fuzzy Delphi with Fuzzy Analytic Hierarchy Process for Multiple Criteria Inventory Classification” , Journal of Engineering, Project, and Production Management, Vol. 3(1), pp. 22-34, 2013.
[9] Hamed Fazlollahtabar, Hamid Eslami and Hamidreza Salmani, “Designing a Fuzzy Expert System to Evaluate Alternatives in Fuzzy Analytic Hierarchy Process”, J. Software Engineering & Applications, Vol. 3, pp. 409-418, 2010.
[10] Ji-Feng Ding, “Partner selection of strategic alliance for a liner shipping company using extent analysis method of Fuzzy AHP”, Journal of Marine Science and Technology, Vol. 17, pp. 97-105, 2009
[11] Kauffman, A. and Gupta, M.M., “Introduction to Fuzzy Arithmetic Theory and Applications”, Van Nostrand Reinhold, New York, 1985.
[12] Ke-Jun Zhu,Yu Jing and Da-Yong Chang, “A discussion on Extent Analysis Method and applications of fuzzy AHP”, European Journal of Operational Research, Vol.116, No. 2,pp. 450-456, 1999.
[13] Ke-yu Zhu, Jennifer Shangc, and Shan-lin Yang, “The Triangular Fuzzy AHP: Fallacy of the Popular Extent Analysis Method”, DOI:10.2139/ssrn.2078576, 2012.
[14] Metin Celik ,I. Deha Er and A. Fahri Ozok, “Application of fuzzy extended AHP methodology on shipping registry selection: The case of Turkish maritime industry”,Expert Systems with Applications, Vol. 36, pp. 190–198, 2009.
[15] Saaty, T.L.,”The Analytic Hierarchy Process”, McGraw-Hill, New York, 1980.
[16] Subhashis Chatterjee, Jeetendra, B.Singh. and Arunava Roy, “A structure-based software reliability allocation using fuzzy analytic hierarchy process “,International Journal of Systems Science, Vol.18, No.5,pp.1-13,2012
[17] Vahidnia, M.H., Alesheikh, A., Alimohammadi, A. and Bassiri, A., “ Fuzzy Analytical Hierarchy Process In GIS Application”, The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Vol. 37,pp. 593-596, 2008.

ISSN: 2319-8753

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 5, May 2014

[18] Weck, M., Klocke, F., Schell, H., and Ruenauver, E.,"Evaluating alternative production cycles using the extended fuzzy AHP method", European Journal of Operational Research, Vol.100, No.2, pp. 351–366, 1997.
[19] Ying-Ming Wang, Ying Luo, Zhongsheng Hua , "On the extent analysis method for fuzzy AHP and its applications", European Journal of Operational Research, Vol. 186, No. 2, pp. 735-747,2008.
[20] Yu-Cheng Tang and Malcolm, J. Beynon., "Application and Development of a Fuzzy Analytic Hierarchy Process within a Capital Investment Study" Journal of Economics and Management, Vol. 1, No. 2, pp. 207-230, 2005.